

Ground-based Tracking of the Huygens Probe During the Titan Descent

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The radio signal from the Huygens Probe will be received using radio tracking stations on Earth as it descends through the atmosphere of Titan. The recording will be used to determine the Doppler shift of the signal and hence the velocity of the Probe in the direction of Earth. These velocity measurements will be used to determine the Titan wind speed as a function of altitude, thereby complementing the Huygens signal measurements on the Cassini Orbiter (DWE - Doppler Wind Experiment, Bird et al., 2002), which yield a velocity measurement in a different direction. The combined measurements will provide confirmation of the basic wind profile and most probably allow a separation of the wind speed into its meridional and zonal components. An experiment with similar scientific goals was performed with the Galileo Probe at Jupiter, the signal Doppler shift being recorded on the Galileo Orbiter (Atkinson et al., 1998) and on the Earth (Folkner et al., 1997). The signal strength received at Earth from Huygens will be comparable to that from the Galileo Probe, and will thus be too weak to detect in real time because of the signal modulation by the (then) unknown telemetry. Instead, wide-band recordings of the Probe signal will be made throughout the three-hour descent. After the Probe telemetry is relayed from Cassini to Earth, the recorded signal is processed against a telemetry template, enabling signal integration over several seconds for determining the Probe frequency. The best available facility for ground-based tracking is the new Green Bank Telescope (GBT), which has a large collecting area and a broad-band receiver covering the Huygens frequency. Details of the technical aspects and anticipated results of the Earth-based DWE are presented.

References:

- Atkinson, D.H., et al., The Galileo Probe Doppler Wind Experiment: Measurement of the deep zonal winds on Jupiter, J. Geophys. Res. 103, 22911-22928, 1998.
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